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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/738,421	12/17/2003	Toshifumi Nakatani	MTS-3490US	8330

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EXAMINER	
HANNON, CHRISTIAN A	
ART UNIT	**PAPER NUMBER**
2618	

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/738,421	NAKATANI ET AL.	
	Examiner	Art Unit	
	Christian A. Hannon	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-7,9,11,17-19 and 21* is/are rejected.

7)☒ Claim(s) *2,8,10,12-16 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 December 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: in figure 5 the box labeled 'Bias' fails to have the label '308' as it is referred to in the specification on page 36. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 3, 7, 9, 11, 17-19 & 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Tikka et al (2003/0060170), hereinafter Tikka.

Regarding claim 1, Tikka teaches a radio communication apparatus comprising an antenna (Page 3, [0051]; Tikka), a transmitting apparatus of outputting a transmitting signal in a first frequency band (Page 1, [0003]; Tikka), a duplexer, connected to said antenna and having a single phase input terminal and a balanced output terminal, of conveying said transmitting signal inputted to single phase input terminal to said antenna and outputting a receiving signal in a second frequency band different from said first frequency band received from said antenna substantially as a differential signal from said balanced output terminal (Page 3, [0049], [0052]; Tikka) and a receiving apparatus connected to said balanced output terminal and having a circuit in which a gain of a signal of a differential component is higher than that of a signal of an in phase component, or a loss of the signal of the differential component is lower than that of the signal of the in phase component. It is hereby noted by the examiner that Tikka's disclosure of systems utilizing separate TX & RX frequencies would inherently cause the gain of the signal of the differential component be higher than that of the signal of an in phase component, as this is the purpose of the duplexer, to inhibit TX & RX crosstalk.

With respect to claim 3, Tikka teaches a duplexer comprising a single phase input terminal connected to a transmitting apparatus and a balanced output terminal connected to a receiving apparatus wherein, said transmitting apparatus outputs a transmitting signal in a first frequency band, conveys said transmitting signal inputted to said single phase input terminal to an antenna and outputs a receiving signal in a second frequency band different from said first frequency band received from said antenna substantially as a differential signal to said balanced output terminal (Page 3, [0049],[0052]) and said receiving apparatus has a circuit in which a gain of a signal of a differential component is higher than that of a signal of an in phase component, or a loss of the signal of the differential component is lower than that of the signal of the in phase component. It is hereby noted by the examiner that Tikka's disclosure of systems utilizing separate TX & RX frequencies would inherently cause the gain of the signal of the differential component be higher than that of the signal of an in phase component, as this is the purpose of the duplexer, to inhibit TX & RX crosstalk.

Regarding claim 7, Tikka teaches a radio communication apparatus comprising an antenna (Figure 6, Item 66), a transmitting apparatus of outputting a transmitting signal as a differential signal (Figure 4, Item 52), a duplexer connected to said antenna and having a balanced input terminal (Figure 6, Input to 10) and a single phase output terminal (Figure 6, Item 135) of conveying said transmitting signal inputted to said balanced input terminal as a single phase signal to said antenna (Figure 6, Item 125) and outputting a single phase receiving signal received by said antenna to said single

phase output terminal (Figure 6, Item 135) and a receiving apparatus connected to said single phase output terminal (Figure 4, Item 54) (Page 4, [0057]).

Regarding claim 9, Tikka teaches a radio communication apparatus comprising one and another antennas (Figure 4, Items 62 & 64), a transmitting apparatus of outputting a transmitting signal as a differential signal (Figure 4, Item 52; Page 4, [0057]), a duplexer (Figure 4, Item 100), connected to said one antenna and said another antenna and having a balanced input terminal (Figure 6, Right Side input of Balun 70) and a single phase output terminal of conveying said transmitting signal inputted to said balanced input terminal to said one antenna (Figure 6, Item 125) and said another antenna and outputting a receiving signal received by said one antenna and said another antenna as a single phase signal to said single phase output terminal (Figure 6, Item 135) and a receiving apparatus connected to said single phase output terminal , and wherein said one and another antennas are formed and placed to radiate said transmitting signal substantially as the differential signal and convey said receiving signal substantially as an in phase signal to said duplexer (Page 3, [0051], Page 4, [0057-0058]).

With respect to claim 11, Tikka teaches a radio communication apparatus comprising, one and another antennas (Figure 4, Items 62 & 64), a transmitting apparatus of outputting a transmitting signal as a differential signal (Page 3, [0051]), a duplexer, connected to said one antenna and said another antenna and having a balanced input terminal and a balanced output terminal (Page 3, [0051]), of conveying said transmitting signal inputted to said balanced input terminal to said one antenna and

said another antenna and outputting a receiving signal received by said one antenna and said another antenna as the differential signal to said balanced output terminal and outputting a part of said transmitting signal substantially as an in phase signal to said balanced output terminal (Page 3, [0050]) and a receiving apparatus (Page 4, [0057]) connected to said balanced output terminal and having a circuit in which a gain of a signal of a differential component is higher than that of a signal of an in phase component, or a loss of the signal of the differential component is lower that that of the signal of the in phase component. It is hereby noted by the examiner that Tikka's disclosure of systems utilizing separate TX & RX frequencies would inherently cause the gain of the signal of the differential component be higher than that of the signal of an in phase component, as this is the purpose of the duplexer, to inhibit TX & RX crosstalk.

With regard to claim 17 Tikka teaches a radio communication apparatus comprising a transmitting apparatus of outputting a transmitting signal (Figure 4, Item 152; Page 4, [0057]), an antenna apparatus (Page 3, [0051]), a duplexer, connected to said antenna apparatus and having a single phase input terminal (Figure 4, Item 115) and a balanced output terminal (Figure 4, Right Side Output of Balun 70), of conveying said transmitting signal inputted to said single phase input terminal to said antenna apparatus and outputting a receiving signal received by said antenna apparatus from said balanced output terminal (Page 3, [0051-0052]) and wherein said duplexer has an impedance for a differential signal in a frequency band of said receiving signal higher than the impedance for a single phase signal in the frequency band of said transmitting signal (Page 3, [0052]).

Regarding claim 18 Tikka teaches the radio communication apparatus according to claim 17, in addition Tikka teaches wherein said duplexer does not substantially pass the differential signal in the frequency band of said receiving signal but passes the single phase signal in the frequency band of said transmitting signal substantially without a loss (Page 3, [0052]).

With respect to claim 19, Tikka teaches the radio communication apparatus according to claim 18 wherein said duplexer has two ¼ wavelength lines having length of substantially ¼ of the wavelength of the frequency band of said receiving signal, and said single phase signal is conveyed to one side of each of said ¼ wavelength lines and said antenna apparatus is connected to the other side of each of said ¼ wavelength lines (Page 3, [0050]).

Regarding claim 21, Tikka teaches a radio communication method comprising the steps of conveying to an antenna a transmitting signal in a first frequency band inputted to a single phase input terminal of a duplexer (Page 3, [0052]), outputting a receiving signal in a second frequency band different from said first frequency band received from said antenna substantially as a differential signal from a balanced output terminal of said duplexer (Page 3, [0048-0049]) and as to said receiving signal substantially outputted as the differential signal, rendering a gain of a signal of a differential component higher than that of a signal of an in phase component, or rendering a loss of the signal of the differential component lower than that of the signal of the in phase component. It is hereby noted by the examiner that Tikka's disclosure of systems utilizing separate TX & RX frequencies would inherently cause the gain of the

signal of the differential component be higher than that of the signal of an in phase component, as this is the purpose of the duplexer, to inhibit TX & RX crosstalk.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tikka in view of McCarthy et al (US 2004/0056819), hereinafter McCarthy.

With respect to claim 4, Tikka teaches an antenna apparatus comprising one antenna having a first feeding point of feeding a receiving signal and also having two or more polarized waves, wherein said first feeding point is placed substantially on an exciting direction side of the receiving signal of said one antenna (Page 3, [0051]; Tikka). However Tikka fails to teach another antenna placed along with said one antenna and having a second feeding point of feeding the receiving signal and also having two or more polarized waves and said second feeding point is placed substantially on an opposite side to the exciting direction of the receiving signal of said another antenna. McCarthy teaches another antenna placed along with said one antenna and having a second feeding point of feeding the receiving signal and also having two or more polarized waves and said second feeding point is placed substantially on an opposite side to the exciting direction of the receiving signal of said

another antenna (Page 1, [0021]; McCarthy). It would have been obvious to combine the teachings of Tikka and McCarthy in order to provide for spatial diversity through use of more antennas (Page 4, [0058]; Tikka).

Regarding claim 5, Tikka and McCarthy teach the antenna apparatus according to claim 4, furthermore McCarthy teaches wherein said one antenna has a third feeding point of a feeding a transmitting signal, said another antenna has a fourth feeding point of feeding a transmitting signal said third feeding point is placed substantially on an opposite side to the exciting direction of the transmitting signal of said one antenna and said fourth feeding point is placed substantially on the opposite side to the exciting direction of the transmitting signal of another antenna (Page 1, [0021-0022]; McCarthy).

With respect to claim 6, Tikka and McCarthy teach the antenna apparatus according to claim 5, furthermore Tikka teaches a transmitting apparatus of outputting a transmitting signal (Page 3, [0049]), a duplexer, connected to said one antenna and said another antenna and having a single phase input terminal (Figure 6, Item 115) and a balanced output terminal (Figure 6, Right Side of Balun 70), of conveying said transmitting signal inputted to said single phase input terminal to said one antenna and said another antenna and outputting a receiving signal received by said one antenna and said another antenna from said balanced output terminal (Figure 6, Right Side of Balun 70) and a receiving apparatus connected to said balanced output terminal (Page 3, [0049]) and having a circuit in which a gain of a signal of a differential component is higher than that of a signal of an in phase component or a loss of the signal of the differential component is lower than that of the signal of the in phase component. It is

hereby noted by the examiner that Tikka's disclosure of systems utilizing separate TX & RX frequencies would inherently cause the gain of the signal of the differential component be higher than that of the signal of an in phase component, as this is the purpose of the duplexer, to inhibit TX & RX crosstalk.

Allowable Subject Matter

7. Claims 2, 8, 10, 12-16 & 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 2, Tikka teaches the radio communication apparatus according to claim 1, however Tikka fails to teach wherein said duplexer has a first phase shifter, a second phase shifter, a third phase shifter, a fourth phase shifter, a fifth phase shifter, said antenna is connected to said first phase shifter and said second phase shifter, said receiving apparatus is connected to said first phase shifter and said second phase shifter via said third phase shifter and said fourth phase shifter respectively, said transmitting apparatus is connected to said first phase shifter and said second phase shifter via said fifth phase shifter and said sixth phase shifter respectively, said third phase shifter and said fourth phase shifter are connected to said fifth phase shifter and said sixth phase shifter respectively, a difference in a phase shifting amount between said first phase shifter and said second phase shifter is substantially 90 degrees, the difference in the phase shifting amount between said third phase shifter and said fourth

phase shifter is substantially 90 degrees and the difference in the phase shifting amount between said firth phase shifter and said sixth phase shifter is substantially -90 degrees.

With regard to claim 8, Tikka teaches the radio communication apparatus of claim 7, however Tikka fails to teach wherein said duplexer has a first phase shifter, a second phase shifter, a third phase shifter, a fourth phase shifter, a fifth phase shifter and a sixth phase shifter, said antenna is connected to said first phase shifter and said second phase shifter, said receiving apparatus is connected to said first phase shifter and said and said second phase shifter via said third phase shifter and aid fourth phase shifter respectively, said transmitting apparatus is connected to said first phase shifter and said second phase shifter via said firth phase shifter and said sixth phase shifter respectively, said third phase shifter and said fourth phase shifter are connected to said firth phase shifter and said sixth phase shifter respectively, a difference in a phase shifting amount between said first phase shifter and said second phase shifter is substantially –90 degrees, the difference in the phase shifting amount between said third phase shifter and said fourth phase shifter is substantially 90 degrees, the difference in the phase shifting amount between said fifth phase shifter and said sixth phase shifter is substantially –90 degrees.

Regarding claim 10, Tikka teaches the radio communication apparatus of claim 9, however Tikka fails to teach wherein said one and another antennas are formed and placed to convey said receiving signal as the differential signal to said duplexer instead of being formed and placed to convey said receiving signal as an in phase signal to said duplexer and said duplexer converts said receiving signal inputted as the differential

signal into the in phase signal and outputs it as the single phase signal to said single phase output terminal.

With regard to claim 12, Tikka teaches the radio communication apparatus of claim 11, however Tikka fails to teach wherein said duplexer has a first phase shifter, a second phase shifter, a third phase shifter a fourth phase shifter a fifth phase shifter and a sixth phase shifter, said one antenna and said another antenna are connected to said first phase shifter and said second phase shifter respectively, said receiving apparatus is connected to said first phase shifter and said second phase shifter via said third phase shifter and said fourth phase shifter respectively, said transmitting apparatus is connected to said first phase shifter and said second phase shifter via said fifth phase shifter and said sixth phase shifter respectively, said third phase shifter and said fourth phase shifter are connected to said fifth phase shifter and said sixth phase shifter respectively, a difference in a phase shifting amount between said first phase shifter and said second phase shifter is substantially -90 degrees, the difference in the phase shifting amount between said third phase shifter and said fourth phase shifter is substantially 90 degrees and the difference in the phase shifting amount between said fifth phase shifter and said sixth phase shifter is substantially 90 degrees.

Regarding claim 13, Tikka and/or McCarthy teach the radio communication apparatus of claims 1, 6, 11 & 12, however they both fail to teach wherein said receiving apparatus has an amplifier in which the gain of the signal of the differential component is higher than that of the signal of the in phase component.

In regard to claim 14, Tikka and/or McCarthy teach the radio communication apparatus according to claims 1, 6, 11 & 12, however they both fail to teach wherein said receiving apparatus has a filter in which the loss of the differential signal is lower than that of the signal of the in phase component.

With regard to claim 15, Tikka and/or McCarthy teach the radio communication apparatus of claims 1,6,11 & 12, however they both fail to teach wherein said receiving apparatus has a down mixer of down converting said receiving signal being connected to a subsequent stage to said amplifier and said down mixer has the gain of the differential signal higher than that of the signal of the in phase component or the loss of the differential signal lower than that of the signal of the in phase component.

Regarding claim 16, Tikka and/or McCarthy teach the radio communication apparatus of claims 1, 6, 11 & 12, however they both fail to teach wherein a first transistor of having one of the receiving signals as said differential signals inputted to a base side thereof and a second transistor of having the other of the receiving signals as said differential signals inputted to the base side thereof, and wherein an emitter side of said first transistor is connected to an emitter side of said second transistor and a connection point thereof is connected to a ground via a first inductor having a predetermined inductance.

With respect to claim 20, Tikka teaches the radio communication apparatus according to claim 17, however Tikka fails to teach wherein said duplexer has a parallel resonance circuit to which said single phase signal is conveyed at a middle point of the

impedance thereof, and said parallel resonance circuit resonates in the frequency band of said receiving signal.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sayers (US 2003/0054791) discloses an RF circuit.

Harada (US 2002/0171508) discloses a front end module.

Franca-Neto (US 6,721,544) discloses a duplexer structure for coupling a transmitter and a receiver to a common antenna.

Ella (US 5,910,756) discloses filters and duplexers utilizing thin film stacked crystal filter structures and thin film bulk acoustic wave resonators.

Nakamura et al (US 6,891,450) disclose a surface acoustic wave filter balanced type filter and communication device.

Yamada et al (US 6,085,071) disclose an antenna duplexer.

Atokawa (US 6,308,051) disclose an antenna duplexer.

Endoh et al (US 2001/0022544) disclose a surface acoustic wave device.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian A. Hannon whose telephone number is (571) 272-7385. The examiner can normally be reached on Mon. - Fri. 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on (571) 272-7882. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christian A. Hannon
July 28, 2006

Quochien B. Vuong 8/4/06

QUOCHIEN B. VUONG
PRIMARY EXAMINER